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Effect of sodium benzoate on Lemon Grass *(Cymbopogon citratus)* ice tea

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Abstract

Sodium benzoate is commonly used as a food preservative to prevent deterioration. According to USEPA standards, the allowable maximum for sodium benzoate in beverages is 0.15%, and 0.13% in fruit juice. A high sodium benzoate intake can induce a variety of illnesses in humans. The current study analyzes the influence of various sodium benzoate concentrations on final product quality. The product was tested to evaluate its physiochemical, proximate, and sensory properties. Acidity, pH, specific gravity, and antioxidant characteristics were identified. The product with the least amount of Na-benzoate performed better than the products with a higher amount of sodium benzoate. Products with 0.06 and 0.07% sodium benzoate were disliked due to a pungent aftertaste, whereas products with 0.05% sodium benzoate were preferred. In terms of physicochemical parameters, all treatments had similar brix, pH, acidity, specific gravity, and antioxidant values. The proximate analyses were also found same for all three treatments.

Keywords: Sodium benzoate; Lemon grass; Ice tea; Preservatives

Introduction

Tea is regarded as the most important beverage all over the world. Tea drinking has been around for a long time, and it has been a regular component of the world's top civilizations, making it a significant food product all over the planet. Kenya, Africa's largest tea grower, supplies roughly one-tenth of global tea production volume. Herbal tea is sometimes mistaken for regular tea and consumed in the same way, although it is different. Because tea normally comes from the *Camellia Sinensis* bush. This bush produces all teas (Schmidt *et al.* 2005). Iced tea is a chilled beverage that is typically sweetened without milk and has a lemony scent. Iced tea is a type of cold tea. It is more than just tea poured in a glass with ice cubes; it is a unique beverage that incorporates several culinary science theories and scientific technical facts. There are many cultural variances in the iced tea formulation sector, and many various types of flavoring agents are used to enhance the aroma and taste of the product (Negrelle and Gomes, 2007).

Lemon grass (*Cymbopogon citratus*) is a perennial tufted grass that grows to a height of 60-90 cm (Figure 1). It belongs to the Graminae family and is widely dispersed throughout the world's tropical and subtropical climates. It originated in India and is also known as Citronella Grass or Fever Grass (Chisowa *et al.* 1998). Lemon grass is a tropical perennial multi-ply aromatic grass that produces essential oil, which is utilized extensively in the pharmaceutical and fragrance industries. Most herbal teas include dried lemon grass leaves as a lemony flavoring ingredient, which is often prepared by decocting or extracting 2-3 leaves in 250 or 500mL of water and various formulations. Lemon grass herbal tea, unlike regular tea, is a diuretic. It never causes any metabolic changes in a human body. The infusion of the leaves produces an aromatic drink with a lemon flavor that is utilized in traditional cuisine (Figueirinha *et al.* 2008). Infusions made from fresh or dried lemon grass leaves are employed in popular remedies on practically every continent and have a wide range of applications. Equally diverse

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Fig. 1. Morphology of lemon grass (*Cymbopogon citratus*)

is the application of chemicals isolated from lemon grass, particularly the essential oil. It is used to treat gastrointestinal issues in India and ansiolitic in China (Peigen, 1983). Lemon grass tea is extensively used in the Mauricio islands and the Malay Peninsula to treat flu, fever, pneumonia, and gastrointestinal disorders (Negrelle and Gomes, 2007).

Cardamom has been frequently utilized in herbal teas for many years. It is highly good for human health as it helps to treat indigestion, avoids stomach pain, alleviates flatulency, and relives cough (Yahyazadeh *et al.* 2021). Drinking a glass of cardamom tea relieves nausea and fights lung disease with a lot of phlegm.

Many food products require the application of various types of preservatives to prevent bio-deterioration. In today's world, processed foods account for around 75% of western societies' diets and must contain various types of preservatives. Sodium benzoate, KMS, sodium nitrite, and potassium sorbate are the most often used preservatives. Sodium benzoate is the most widely used synthetic additive in the food industry and is generally considered safe (GRAS). With a natural pH of 4.5, sodium benzoate is a benzoic acid salt that is used as an essential preservative in many industrial food items against bacterial and fungal activity, as well as yeast. Sodium benzoate is used to preserve margarine, fresh juices, and sweets. Because it is a preservative, it can be employed in industries other than food, such as pharmaceuticals and cosmetics. In this study, a lemon grass iced tea was developed with the primary goal of replacing traditional black tea with lemon grass iced tea as a healthful beverage with functional benefits.

Materials and methods

Collections of samples

Samples of lemon grass and cardamom were collected from botanical garden of PCSIR lab Complex Lahore, Pakistan and kept at room temperature prior to analysis.

Formulation of lemon grass iced tea

The extraction procedure during tea preparation is considered one of the most critical factors for determining the sensory characteristics of the beverage (Hara *et al.* 1995). The extraction of tea is determined by various factors, such as the tea-to-water ratio, length of infusion (Choi *et al.* 2000), temperature of infusion (Jaganyi and Price 1999; Choi *et al.* 2000; Jaganyi and Mdletshe, 2000; Sharma *et al.* 2005; Weerts *et al.* 2005; Xia *et al.* 2006), type of infusing water (Yau and Haung, 2000) and type of tea (Shin, 1994; Kim *et al.* 2002; Liang *et al.* 2003).

Trial 1

For one liter, 10g of lemon grass was weighed and soaked in 880 ml of hot water for around 30 minutes. After 30 minutes, 1.4g of cardamom was added to it. The formulations were left to infuse for ten minutes. Later, 120g of sugar and 2.2g of citric acid were added and properly mixed, followed by 0.5g of sodium benzoate as a preservative and the mixture was placed into cleaned pet bottles.

Trial 2

For one liter, 10g of lemon grass was weighed and soaked in 880 ml of hot water for around 30 minutes. After 30 minutes, 1.4g of cardamom was added to it. The formulations were left to infuse for ten minutes. Later, 120g of sugar and 2.2g of citric acid were added and properly mixed; 0.6g of sodium benzoate was added as a preservative, and the mixture was placed into cleaned pet bottles.

Trial 3

For one liter, 10g of lemon grass was weighed and soaked in 880 ml of hot water for around 30 minutes. After 30 minutes, 1.4g of cardamom was added to it. The formulations were left to infuse for ten minutes. Later, 120g of sugar and 2.2g of citric acid were added and properly mixed; 0.7g of sodium benzoate was added as a preservative, and the mixture was placed into cleaned pet bottles.

Physicochemical analysis

The created products were tested for acidity, pH, brix, and specific gravity. All processes were carried out in accordance with the methods stated in AOAC 2016.

Antioxidant Activity

Antioxidant activity was evaluated as described by Brand-Williams, (1995). The scavenging free radicals were measured as:

DPPH scavenging activity (%) = (A0–A1) /A0×100

Where, A1 is the sample absorbance and A0 is the control absorbance

Sensory analysis

Sensory features of the products were also assessed by a panel of experienced food technologists using a nine-point hedonic scale as shown in Table I. according to the method as described by Pushpa *et al.* (2006).

Table I. Results of physicochemical, sensorial and microbiological attributes of lemon grass ice tea

Sodium benzoate %	Acidity (%)	pH	Specific gravity	Brix	Antioxi dant activity	Sensory evaluation				Microbiological analysis (CFU/ml)		
						Color	Taste	Aroma	Overall accepta bility	TPC (cfu/ml)	Yeast and mold (cfu/ml)	Colifor ms (cfu/ml)
T_1 0.07	0.26	3.56	1.0283	12.60	80.20	7	3	5	4	< 1000	< 10	Not detected
T_2 0.06%	0.26	3.54	1.0282	12.58	80.60	7	4	7	7	< 1000	< 10	Not detected
T_3 0.05%	0.27%	3.52	1.0281	12.57	81.21%	8	8	7	8	< 1000	< 10	Not detected

Nine point hedonic scale: 1=Extremely dislike, 2 = Strong dislike, 3 = Moderate dislike, 4 = Slight dislike, 5 = Neutral, 6 = Slight like, 7 = Moderate like, 8 =Strongly like, 9 = Extremely like

Proximate analysis

Proximate analysis of lemon-grass iced tea was done using the method of Association of Official Analytical Chemists (AOAC, 2016) and Pearson's composition and analysis of food (Table II).

Table II. Proximate analysis results of the lemon ice tea product

Sr. No.	Parameters	% Values
1	Moisture	87.37
2	Protein	0
3	Fat	0
4	Carbohydrates	12.60
5	Crude Fiber	0
6	Ash	0.012
7	Calories	50 (Kcal)

Microbiological evaluation

Microbiological analyses were determined according to the method as described by American Society for Microbiology (1982) as shown in Table I.

Results and discussion

Tea is the most popular beverage in the world, second only to water (Schmidt *et al.* 2005). The worldwide tea market is predicted to develop steadily. The physicochemical and sensory properties of three formulations were evaluated. The amount of Na-Benzoate varied throughout all three formulations, but the other chemicals remained constant. According to a sensory review conducted by a panel of professional judges, the initial formulation T1 with the least quantity of Na-benzoate (0.05%) was the best of the three, whereas the other two formulations T2 and T3 with 0.06 and 0.07% Na-benzoate, respectively, were disliked. There was no significant variation in physical and chemical attributes between the T1, T2, and T3 formulations. T2, T3 have the same harsh aftertaste, which makes them unacceptable, however T1 does not have such an off taste and is therefore preferred. T1 was accepted overall because it had no aftertaste, however T2 and T3 were rejected due to their unpleasant flavor. The off flavor in T2 and T3 could be owing to a high level of Na benzoate, but the acceptable taste in T1 is likely related to a smaller amount of the same additives in the formulation. Though the maximum legal level for Na-benzoate is 0.1% under various food laws and regulations, the optimal dosage of 0.05% produced satisfactory sensory findings. Microbiological study of the same items revealed that 0.05% Na-benzoate was also efficient against food spoilage organisms, with no yeast or mold contamination, which is the most common deterioration in beverages.

Despite its expanding popularity around the world, little research has been conducted on the sensory properties of ice tea. There are numerous plant materials with various sensory properties that could be used to make ice tea. There is a need for research into the possibilities of mixing different plants in varying quantities to create different products. Blends may elicit different qualities that are more appealing to the senses than individual herbs.

Conclusion

According to a sensory review conducted by a panel of food judges, the first formulation with the least quantity of

Na-benzoate (0.05%) was the best of the three, whereas the other two formulations with 0.06 and 0.07% Na-benzoate were disliked due to a bitter aftertaste. There was no significant variation in physical and chemical attributes between the three formulations.

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